SCHOOL OF EDUCATION
LIBRARY

The American Biology Teacher

Vol. 10 APRIL, 1948 No. 4

Flatford Mill Field Center
- - - - - - E. A. R. Ennion 93

Contributions of Psychiatry to Mental Rehabilitation
- - - Michael Kasak, M.D. 96

Teaching Bird Identification With Pictures
- - - - - - Jesse V. Miller 100

A Physiologist Replies
- - - - - - - S. A. Corson 102

Books - - - - - - - - - - - - 105

News and Notes - - - - - - - - 106

PUBLISHED BY
The National Association of Biology Teachers

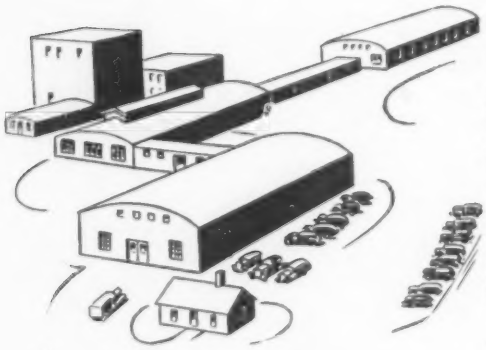
Entered as second class matter October 26, 1939, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

milvay CELEBRATES 40 YEARS SERVICE IN LABORATORY EQUIPMENT

During 40 years, Chicago Apparatus Company has progressed from a relatively small company serving a limited territory, to an organization providing world-wide service in scientific equipment and supplies. To allow for necessary expansion, our Chicago factory and warehouse has been augmented by a new modern factory.

A NEW PLANT AT POLO

The new plant, located at Polo, Illinois, in addition to our main Chicago offices and warehouse, gives us 120% more floor area and land for still further expansion. These increased facilities enable us to greatly increase production while maintaining our high quality standards and efficient service.



The growth of Chicago Apparatus Company has been made possible by a strict adherence to accuracy and dependability and by the continued loyalty of thousands of customers throughout the years. From a few specialized items in the beginning, we now supply over 20,000 items.

In addition to those manufactured by us, we distribute thousands of products made by the most prominent manufacturers of scientific and laboratory equipment throughout the world.

Among those who continuously use our service are Governments, Municipalities, Scientific Institutions. Industrial Enterprises, Commercial Houses, Public Utilities, Universities, Schools and Importers. To them we offer a single, convenient, reliable source of supply for all their laboratory needs.

Let us know your requirements, and we shall serve you to the best of our ability.

CHICAGO APPARATUS COMPANY
CHICAGO 22, ILLINOIS

MANUFACTURERS OF
PRECISE SCIENTIFIC EQUIPMENT SINCE 1908

TESTED AND APPROVED · milvay · SCIENCE LABORATORY EQUIPMENT

The American Biology Teacher

Vol. 10 APRIL, 1948 No. 4

Flatford Mill Field Center

E. A. R. ENNION
Honorary Warden, Flatford Mill Field Center, County of Essex, England

On May 25, 1946, two parties of students came to Flatford Mill. One was a group of second year geography teachers-to-be from a London Training College; the other, arriving late in the evening, a crowd of sixth form schoolgirl biologists from a Yorkshire factory town. These were the Field Center's first residents. It had been none too easy to get building alterations done just after the war and equipment of all kinds was pretty hard to find. Bit by bit, things came dribbling in and what the builders could not do we did ourselves. We had beds and blankets, knives and forks and cups and dishes, and we had food. We laid tables for dinner that night at one end of the refectory, while the painters were taking their planks and trestles out through the other door.

Flatford Mill, the home of Constable, famous English landscape painter of a century ago, had taken on a new lease of life. It had lost its waterwheel and its milling machinery and had lain moribund for nearly forty years. By the end of September, 1946 (when, for lack of light and heat, we had to close) 350 students of art, geography and natural history of one kind or another had stayed at the Center for varying lengths of time. And nearly all of them said they would come again next year.

Many of them did. We re-opened at the end of March, 1947, after the frosts and floods and gales of one of Britain's coldest winters for years. During that long winter we had planned and schemed. Despite the problem of getting essential work done and equipment supplied —everything, from test-tubes to refectory tables, was becoming more and more difficult to obtain—we enlarged our sleeping, living and laboratory accommodation, our library, our kitchen premises and staff. We took over the lease of an ancient timbered building opposite the Mill, the Valley Farm. Late that summer, we had 56 students in residence at one time, the overflow sleeping in two tents. And once we took a bunch of students out on an all-night foray to snatch their beds (though they didn't know it!) for a party of teachers coming for a short week-end.

The season for 1948 opened with a

Outside on the lawn a Field Study class is in progress. All photos by courtesy of British Information Services.

flying start on December 29, 1947. The first organized outdoor winter biology courses to be held in Britain (so far as we know) had been planned and the forward booking list, at time of writing, was steadily filling up. Moreover there are four Field Centers to choose from now instead of one.

Nature Instead of Text Books

But what *is* a Field Center, and why do all these students come? The man who set the ball rolling was F. H. C. Butler, an Inspector of Education (Science) for the London County Council. He saw the folly of teaching biology and kindred subjects almost entirely from textbooks and jars on the museum shelf. He realized the difference it would make if students could teach themselves these subjects at first hand. And so, in 1943, he made inquiries in scientific circles and his proposals soon gained very wide support. *The Council For The Promotion Of Field Studies* was founded in December of that year. Butler and I are fellow graduates of Cambridge University, and I was one of his first supporters. He is a man of energy and vision who could see the possibilities ahead. He realized that by leavening the masses of young people flocking outdoors at week-ends with a few Field Study advocates, it might be possible to effect a wider appreciation of—and hence a kindlier attitude towards—the glories and wild life of the British countryside. A significant cross section of young leaders would be passing through the several Wardens' hands when ten or twelve Field Centers should come into being. Four of those Centers, East, West, South and North, have now been realized. We are concerned with the East.

Flatford Mill had just been purchased by Britain's National Trust. It needed a sympathetic tenant. With fittings, furnishings and some interior conversion, for which the Carnegie Trust most generously promised to become mainly responsible, the Mill and its adjacent

buildings would make the most perfect Center in the perfect setting. The countryside around is rich and varied in soil and vegetation, its wild life and its country ways and history.

The Urge to Know

They come from all over Britain, from town and country, from every kind of school, from Training Colleges and from Universities; they come alone, in two's and three's, in classes of thirty or more, with or without their own teachers. Nearly one-third are independent naturalists or artists, the youngest fifteen, the oldest over eighty! They range from the expert research worker on a "busman's holiday" to those whose only claim is a vast enthusiasm. Often the only common factor is the urge to know more about some Field Study object. It may be birds or insects, trees or seaweeds, crops or soils or country buildings, mid-Stone age flints or land surveying, village halls or water snails; it is up to us—the Center Staff—to see that no one is disappointed.

Assistant Warden Sankey checks on a species of beetle found during the day's survey of a piece of land near the Mill.

Most students stay a week. About half the season's program is made up of "weeks" and special Courses on particular subjects—Spring Biology, Social Insects, Outdoor Sketching, Plant-Insect Borderline are four titles taken at random—to which any genuinely interested person, or student group, may come. A few of the Courses are designed for research level students. Most, presuppose some previous knowledge, the exact pitch being left until the Warden has met his class-to-be and found out something of their individual capabilities and wishes. This, and conditions imposed by the seasonal rhythm of the countryside and by the weather, determine the day-to-day activities of the class within the larger framework of its title subject. This flexibility, supple enough to take advantage of a mayfly hatch or a migrant wisp of waders on the estuary flats, coupled with a constant watch for individual flairs and fancies, makes for the success of the school. Students are not so much told or shown things as sent out to discover for themselves. Apart from a short preliminary "briefing" the explanations and discussions happen after they get back. By adapting and simplifying the various methods of ecological research—grids and counts and samplings of all kinds—and by setting carefully graded problems for carefully chosen teams, we get the maximum amount of searching, finding, wondering, deciding and recording done by everyone. And *that* kind of knowledge sticks.

Students in the laboratory, sorting out their various discoveries.

Very many of the students who come are teachers, or will be teachers, or community leaders. They are not merely shown a lot of plants and animals and told their proper names. Nor are they

shown how these plants and animals live in relation to one another as an end in itself.

A great deal of the teaching at Flatford Mill is designed to show methods of survey and ways of investigation that could be applied elsewhere and adapted to other problems of a similar kind. Already we know that several plots of vacant land, old gravel pits and unkept gardens within reach of certain schools, are now being used in the Field Study way. Those are measurable results.

Field Centers have a two-fold part to play. They offer opportunities for ecological investigation and they bring the benefit of first-hand study and the discipline of scientific method within reach of an ever-growing section of the people. Above all, the inspiration at Field Centers springs from life itself.

Contributions of Psychiatry to Mental Rehabilitation*

MICHAEL KASAK, M.D.

Division of Psychiatry, Marquette University, and Milwaukee County Hospital for Mental Diseases, Wauwatosa, Wisconsin

The most spectacular and important attainments in medicine have not been in the treatment and curing of diseases, miraculous as some of these cures may seem, but in prophylaxis or prevention. We have very few drugs that may be called specific for certain diseases. We have atabrine and quinine for malaria; emetine for amebic dysentery; arsenicals for syphilis, etc. But what about smallpox, typhoid and typhus fevers, bubonic plague, cholera, and others? Glance at the history of these diseases. Here is one—the bubonic plague—which appeared in Europe about 1348 after decimating the populations of Asia and Africa. It probably holds the world's record for quick mass killing of human beings, and this record is one-fourth of the entire population of the globe at that time, namely, over sixty million dead in its wake. One should read the eyewitness accounts of this dreaded "Black Death" in order to imagine the panic, confusion, and agony it created wherever it appeared. All these infectious diseases of the past have made indelible impressions on the life and culture of the people and probably have changed the evolution and the course of the communities affected. Today they have become either very rare or completely extinct in our country and in Central and Western Europe. None of them were eliminated by specific drugs but by understanding the real causes, their spread, and by application of modern medical prophylaxis or preventive measures. We still have tuberculosis, often called the white plague, with no specific drug for it, but by detecting it early, by preventing its spread, and by curing or arresting it in the early stages, we have succeeded in reducing the mortality as compared with that of 40 or 50 years ago.

From the above it is self-evident that in mental rehabilitation we must likewise emphasize prevention of mental disorders be they mild or be they serious, or at least stress the necessity of instituting proper treatment very early. But before we proceed, let us look closer

* Presented as part of symposium on Teaching of Behaviour, Chicago Meeting, Dec. 30, 1947.

at the problems which psychiatry is confronted with in dealing with mental rehabilitation. First, what can we say about the magnitude of the problem?

One hundred years ago (1840) the United States had a population of 17,069,453 and had 2,561 mental patients locked up in institutions. By 1940 the population had risen to 131,669,275 with more than 600,000 patients locked up, and in 1947, with the estimated population of 144,708,000 we have about 800,000 mental patients in institutions. In other words, in the last 100 years (1840–1940) the general population had risen 671% but that of the hospitalized mental patients 23,328%. As a matter of fact, the number of patients in institutions doubles every 25 years, and today mentally ill patients occupy one-half of all the hospital beds available, of which we have a total of 1,435,778 beds, according to the American Hospital Directory for 1947. There are eight to ten million people outside of hospitals who are in great need of adequate mental treatment, of whom more than 200,000 will enter the institutions every year and help to increase the number of hospitalized patients.

But these figures do not represent the total problem involved in mental rehabilitation. We have to add more than 750,000 alcoholics who cannot live without a drink and cannot live with a drink since they misbehave under the influence of liquor and some of them cannot tolerate even a small amount. They have been designated quite aptly as people allergic to alcohol. Elimination of alcohol by means of prohibition does not solve the problem. Alcohol cannot be blamed any more than the rose for rose fever—the fault is with the alcoholic—with the personality who cannot tolerate certain things, be it alcohol, roses, strawberries, nuts, eggs, horses, dogs or shellfish.

Then what about the children and adolescents, the so-called juvenile delinquents? What about some criminals, the sexual offenders, the unemployables, the maladjusted in various occupations, in marriage, at home, and in society? What is their total number? I do not know and my guess probably would be no better than anybody's. But one thing I do know positively and that is that all these unfortunates belong in the domain of psychiatry.

Here then we have a problem for mental rehabilitation truly appalling in its magnitude. It becomes even more so when we are faced with the sad fact that out of a total of 185,905 (April, 1947) doctors in the United States, only about 5,000 are working in the field of psychiatry. Moreover, perhaps better than one-half of these 5,000 psychiatrists are closely linked with the treatment and care of the 800,000 patients in public and private institutions, giving an approximate ratio (with all liberal allowances) of one psychiatrist to 200–320 institutionalized patients. Under such conditions, how much time can the doctor devote daily to an individual patient? Besides these patients, he has to see others in out-patient clinics, carry on teaching of student nurses, medical students, and young doctors specializing in psychiatry.

Now let us look at the other half of the existing psychiatrists—2,500 in all. They are expected to treat in their offices or the homes of patients about 8,000,000 people who are in need of psychiatric help. In other words, each psychiatrist is to treat 3,200 patients should everyone of this number apply for help. The whole thing sounds absurd but I am sorry to say it is a painful reality—a fact. Will we humans ever reach the stage when we will have just as many doctors to treat the psyche as there are to treat the body? What miracles we

would accomplish if we had today 180,000 specialists in psychiatry instead of 5,000!

But let us go back to the painful reality of today and ask a question. Why is there such a shortage of psychiatrists and why is there a highly inadequate treatment of mental patients both in institutions and outside? This is primarily due to lack of knowledge and understanding of mental disease in general and mentally sick patients in particular by the general public, legislative bodies, and even educated, professional people. The mentally ill who for centuries had been looked upon as possessed by evil spirits or criminals and treated accordingly, have only recently emerged from the cages and dungeons, jails and poor houses. But even today there is prejudice and superstition in regard to mental disease resulting in lack of interest bordering on fatalism. It is hard to believe that only about two hundred years ago people went for diversion and recreation not to the zoo, like we do today, but to insane asylums to see the insane and often paid a small fee. But while in the zoo we are not allowed to tease the animals, it was expected of the attendants to tease the patients into action with the old idea in mind that when you have paid for a show, you must see one.

We have seen already that of late more than 200,000 patients enter annually mental hospitals where they are examined, studied, observed, diagnosed, and treated. Without entering here into a discussion of detailed classification, one may say that all mental disorders can be grouped into three major divisions, namely, the organic, toxic, and psychogenic. In the *organic group* belong about 40% of the admitted patients who show definite pathological changes in the brain as are seen in such cases of cerebral arteriosclerosis, neurosyphilis, and brain injuries. The *toxic group* is the smallest in numbers—about 8 to 10% on admission. The various toxic psychoses are caused by poisons affecting the brain. These poisons may be introduced into the body from the outside, such as alcohol and drugs, or they may arise within the body because of malfunctioning of some organ, such as kidney or thyroid gland. Finally, the *psychogenic group*, to which belong such well-known common mental disorders as psychoneurosis, schizophrenia, and manic-depressive psychosis, is the largest of all, about 50 to 60% of all cases on admission. Here the causes are purely mental, emotional, with no pathology in the brain or the body. The mind simply gets "twisted" as the saying goes. Besides these three large groups there are psychoses or insanity complicating epilepsy and mental deficiency.

The recent war produced new mental problems but did not produce new and different diseases. Depending on the precipitating factors, they often received new names, such as war neuroses, battle fatigue or combat fatigue. The treatment, of course, is the same, but modified to suit the existing conditions either while in the army or navy or after the discharge during the adjustment period to civilian life again.

In the meantime, let us note that psychiatry has clarified many concepts in the sphere of our psychic activity and human behavior. We know today that the symptoms of mental disease, be it true psychosis or psychoneurosis, manifest themselves in the conscious life and interfere with the normal behavior of the patient but that the etiology or cause lies in the unconscious. For that reason it is useless effort to treat the symptoms unless we get at the root of these symptoms, down deep in the unconscious. There are various schools and methods, and techniques of *psycho-*

therapy but they all aim at one thing, i.e., removing from the patient the annoying symptoms which modify his behavior by removing the causes in the unconscious. You no doubt have heard of the school of Freud, Jung, Adler, Stekel, the Psychobiologists, etc. Occasionally embittered arguments have ensued as to which of them is the best and the most scientific. In my opinion, any method is good which gives results by curing the patient in the shortest time. There is no doubt that more than one road leads to Rome—one technique is good in one hand, another in another's.

Psychotherapy must be individual and personal and the patient must have complete trust and confidence in the physician. Technically this is called rapport or transference and is a purely emotional phenomenon. We all have our likes and dislikes for different people which we cannot always explain intellectually. Individual and not group psychotherapy is the treatment par excellence, particularly if reinforced by other therapies such as drug, physical, occupational, industrial, recreational, or whatever the need may be. That this form of treatment is prolonged and expensive is no reason against its application. But there are very many patients suffering from the more advanced forms of the graver psychoses, such as paranoia and schizophrenia for instance, where psychotherapy cannot be applied. These patients, as a rule, lack insight and cannot establish a transference and will not cooperate. By insight we in psychiatry mean the patient's realization that he is ill. A deluded paranoiac has no insight since he is firmly convinced that there is nothing wrong with him and that there is everything wrong with his family, co-workers, friends, public officials, and others who are in complot to annoy him, persecute him, poison him, incarcerate him, and finally destroy him. Such patients will oppose and fight any form of treatment and care and have to be committed by the court to an institution where the necessary treatment may be administered even against the patient's wishes. I may add that the psychiatrist is not the only one who sometimes has to treat the patients against their wishes; so does the pediatrician, so does the veterinarian.

Even from the sketchy grouping of mental disorders mentioned above, it is self-evident that treatment differs with the disease and the individual patient. Besides the various forms of psychotherapy we have at our disposal many other forms of treatment, such as drug, fever, malaria, dietary, physical, occupational, industrial, music, recreational, biblio- (reading of selected books), insulin and electric shock therapies and psychosurgery.

In *Group Psychotherapy* one therapist treats not one patient but a whole group by bringing them together for open forum discussion of mental illness in general and their own problems in particular, at the same time suggesting means of solving them. Patients are expected to join in the discussion and ventilate their problems. In skillful hands this form of treatment has given very good results, particularly in the mild mental disorders such as the psychoneuroses.

In *Narco-analysis* we try to induce a light sleep by the intravenous injection of small doses of either sodium amytal or sodium pentothal, aiming to depress both the cortex and hypothalamus and thus abolish the abnormal conditional reflexes, without producing deep sleep. In this state the patient, may, upon repeated questioning, reveal fears, paranoid trends, but especially anxieties and episodes in his life which may be factors in producing his illness.

In *Shock Therapy,* whether the shock is induced by metrazol, insulin, or electricity, the aim is to produce either epileptiform convulsion with loss of consciousness or stupor or coma without convulsion. This treatment makes the patient more amenable for any other therapy such as psychotherapy, occupational therapy, etc.

In *Psychosurgery,* called also lobotomy and leucotomy, the neurosurgeon cuts the fibers in the brain that connect the thalamus and the pre-frontal lobes. The aim is to relieve the intellectual center from continuous influence of the emotional center. In other words, the intelligence and cognition remain unaffected but inner emotional feeling undergoes a change. This therapy gives good results in patients suffering from tension, anxiety, compulsions, and fears.

Whether you believe in Oedipus, pre-Oedipus, and Electra complexes or not, mental hygiene is important in childhood and adolescence at home, in school, and on the playground. Here lies the fertile soil into which all kinds of "mind twists" and deviations and future total breakdowns strike the root, grow rapidly like weeds, and crush everything what is normal, good, and beautiful in the psyche. Parent and teacher cooperation gives good results; all this is a special topic in itself. But always remember that each child, each adolescent must be handled as an individual problem, and that prevention, or at least treatment in the beginning of the disease, when it offers a good prognosis and results in complete recovery, is our solution of the problem of mental disorders.

References

Garrison, Fielding H. *An Introduction to the History of Medicine.* Second Edition. Philadelphia, W. B. Saunders Co., 1917, pp. 172–3, 406–7.

Richardson, A. E. *Georgian England.* New York, Charles Scribner's Sons, 1931, p. 95.

Vogel, Victor H. *Mental Hygiene in the State Health Department.* Washington, Government Printing Office, 1941. (Reprint No. 2221 from Public Health Reports.)

Teaching Bird Identification With Pictures

JESSE V. MILLER
Manhasset High School, Manhasset, New York

Many biology and general science teachers avoid instruction in bird identification because of the difficulties involved in arranging and conducting field trips. Lively high school youngsters, untrained in field techniques, put definite limitations on the number of individuals that can be included in any field group. Twelve to fifteen pupils seem near the upper limit if birds are to be observed close at hand. Each class of 25 to 30 must be divided into at least two sections for field work, and where a teacher has several such classes, so many field groups become involved that the whole idea of field trips is abandoned.

Several plans have been tried to alleviate this situation. The most effective method used by the author during fourteen years of bird instruction has been to combine colored-picture instruction with field work for selected groups. This can be done even with large classes and with four or five sections by "rewarding" those who show interest and progress in the picture identification. The "reward" can be field trips for as many students as a teacher's time will allow.

Teaching identification by pictures requires a good set of colored pictures. A better job can be done if one has a room that can be darkened, and a flat-object, or opaque, projector (stereopticon) or a Kodachrome ($2'' \times 2''$) projector with colored $2'' \times 2''$ slides. The only essential is the pictures, which can be held up for the class to see in a light room, without projection. A good set of pictures can be collected from magazines, or purchased ready made. Pictures collected from magazines will last longer if mounted on cardboard backings of convenient size. A good set from magazines may take several years to accumulate. This should not deter any teacher from immediate use of those pictures he does possess. Pupils from the classes will want to contribute to the collection; in fact, what could be a better class project than the collection of such a set of pictures?

The pictures are shown to the class in a light room, or projected in a darkened room. The teacher points out spot characters for each bird shown—size, color characters, bill shape, or whatever traits are most valuable in identification. Pictures should be arranged by the instructor so as to show in sequence those birds likely to be confused. It is well to start with a small number of common, easy birds (perhaps 10). Avoid the "hard-to-learn" types at first, such as warblers and sparrows. These may be worked in slowly after the class has made a start.

The period should be so planned that time is available to write down the names, and perhaps the spot characters for each new species shown. Printed lists may be used; in any case it is usually necessary to give added attention to spelling.

Each new lesson after the first should start with a review. Go over those birds which students have difficulty remembering, as well as some of the "old friends." This may be done by running a "mock test" in which everybody writes down the name of each bird shown, and takes credit for those correctly identified. The teacher names each bird immediately after it is shown, or asks members of the class to do so. Spot characters may be brought out for each bird before the next one is shown. After the "mock test" five new birds may be shown and added to the list. As the total number of species increases, the number of new species added should decrease. It may be desirable to present no new species if the class shows need for more experience with the old. It is better to teach 20 species well than 50 inadequately. Students may do outside study by using books containing colored pictures.

A weekly picture *exam* will indicate those pupils who know the most birds or who have made the most progress. The best of these students may be invited on the field trips. A few from previous "best" groups who have maintained a place of prominence, plus new ones who have shown outstanding improvement may be invited. In this way no one will feel that hope is lost if he doesn't make the first group to be honored. One or two trips a week during the migration season (roughly May 1 to June 15 on Long Island) should give your bird enthusiasts a good start. Some of the best may want to form a *bird club*. What could be a better follow up to your classroom teaching?

If you would like to measure your teaching effectiveness give a *pretest* before you start, then a *final* at the end of the unit. Use the same set of pictures for each test. Two sets of pictures are needed to do this most effectively, one set for teaching and another for testing. Students may learn to identify certain birds from their positions or surroundings. In this case they will not recognize a different picture of the same species.

BIBLIOGRAPHY

Sources of Bird Pictures in Color

Audubon Bird Cards, 3 sets. The Nat'l Ass'n of Audubon Soc., New York City

Life Magazine—a series has been printed in recent years including warblers, jays, sea birds, owls, etc.

Kodachrome 2″×2″ slides. The Stanley Bowmar Co., New York 23

Sets of small bird cards—Church & Dwight Co., New York

National Geographic Magazine. Second-hand numbers available at book stores, Salvation Army, from students, etc.

1914 May—Warblers and others; 1917 April—Warblers; 1932 July—Hummingbirds, Swifts; Oct. Wading Birds; 1933 Jan. Crows, Jays; April—Woodpeckers; July—Eagles, Hawks; 1934 Mar.—Inland water, marsh birds; May—Kinglets, Wrens, Chickadees, small birds; July—Blackbirds, Orioles; Oct.—Geese, Ducks, Swans; 1935—Apr.—Tanagers, Finches; 1936 Apr.—Thrushes, Thrashers, Swallows; June—Flycatchers, Kingbirds; Oct.—Game Birds; 1937 Aug.—Shore Birds; 1939 Mar.—Sparrows, Towhees, etc.; June—Dr. Allen's Kodachromes; 1942 Feb.—Dr. Allen's Kodachromes; 1943 July—more of same; Nov.—Terns, Pelicans; 1944 June—Dr. Allen's Kodachromes; 1945 Apr.—Western Owls; 1946 Sept.—Dr. Allen's Kodachromes (24). (See also National Geographic Index in Library)

Bird Books with Colored Plates

Birds of Massachusetts, etc.—Forbush—Vols. 1 and 3 are still in print. Dept. of Agric., Commonwealth of Mass., State House, Boston

Birds of America—T. Gilbert Pearson, Ed. Garden City Pub. Co., Garden City, N. Y.

National Geographic Book of Birds—Nat'l Geog. Soc., Washington, D. C.

Audubon Bird Guide, Eastern Land Birds—Pough—Doubleday, distributed by Nat'l Ass'n of Audubon Soc.

A Field Guide to the Birds—R. T. Peterson, 1947—Houghton, Mifflin Co., Boston

Birds of New York—E. H. Eaton—State Museum, Albany, N. Y.

Birds of Minnesota—T. S. Roberts—U. of Minn. Press, Minneapolis

Florida Bird Life—E. A. Howell—Nat'l Ass'n of Audubon Soc.

A Physiologist Replies . . .

This letter by Samuel A. Corson, Ph.D., was written in response to an antivivisection query. His reply is outstanding in its clarity and persuasiveness. Dr. Corson has since gone to Howard University, Washington, D. C., where he is now associate professor of physiology. The letter was published originally in the January–February BULLETIN *of the National Society for Medical Research.*

July 10, 1947

Mrs. Arthur Wellesley
406 Aragon Avenue
Coral Gables 34, Florida

Dear Mrs. Wellesley:

Thank you very much for your thoughtful letter of June 25 addressed to President J. L. Morrill and referred to me for a reply.

I wish to state at the outset that we believe that in writing your letter you were motivated by a sense of compassion for all living things. We share that sense of compassion with you. It was my chief reason for becoming a medical research worker. I wanted to understand the nature of the phenomenon of life, and particularly that of human life. Apart from natural curiosity I wanted to use the knowledge thus gained in order to eliminate, or at least alleviate, the pain and suffering caused to human beings by disease.

It is quite proper that you should ask us why it is necessary to experiment on animals in order to understand and cure human diseases. You are justified in asking why not make careful case histories of human patients suffering from dropsy.

Such observations are actually being made in many hospitals. Unfortunately such studies alone cannot give us the understanding necessary for an intelligent

treatment of this or any other disease, since we cannot experiment on human beings. Surely you would not suggest that we follow the example of the Nazi physicians and perform experiments on human beings?

We produced dropsy (or edema, the usual medical term for the disease) in dogs not because we wanted to amuse ourselves at the expense of the dogs. We wanted to know two things, (a) What conditions produce edema? and (b) How can we best treat such a disturbance once it occurs?

The very fact that we succeeded in producing edema in dogs gave us at least a partial answer to the first question. We know at least one condition which will produce this disease and we can look for it and correct it when we find such disease in man. Unfortunately, the human organism is very complex and so are the human diseases. There are usually a number of different factors and often a combination of many factors which cause disease. They have to be traced down one at a time.

The second problem, that of treating the disease, involved the testing of different drugs. Surely you would not suggest that physicians test unknown drugs on humans?

When on the basis of our medical knowledge we suspect that a certain drug may cure or alleviate a certain disease we cannot be sure that it will actually do so. Often a number of related drugs must be tested before the right medicine is found. In many cases the chemists have to be called in to modify the available drugs in order to accomplish a cure.

You have undoubtedly heard of the drug 606, or salvarsan, used in the treatment of syphilis. Dr. Paul Ehrlich who discovered this cure in 1909 tested 606 different drugs on many rabbits before he discovered the one that would cure syphilis. That is the reason he called it 606. He also nicknamed it "Salvarsan," meaning a drug that would save mankind. Surely you don't think that it would have been better if Dr. Ehrlich had tested these drugs on human patients. Many of the tested drugs were found to be very toxic and a good many of the drugs tested killed the rabbits. Would it have been preferable to have killed hundreds of humans rather than rabbits? You must remember that animals can usually withstand many toxic substances better than humans can, so that undoubtedly many more humans would have been killed than rabbits.

This example is characteristic for all drugs. Even when we know that a drug is effective in the treatment of a certain disease, we often find that the drug may exert undesirable toxic side effects. It is therefore necessary to modify the drug, test it on animals, and perhaps repeat this procedure several times before the right drug or combination of drugs is found.

But even at this stage we are not ready for the patient. We must first find out how much of the drug is required for the proper treatment of the disease. If you don't give enough the patient will not be cured. In some cases we cannot afford to waste time and find out by trial on the patient what the right dose is. The patient often requires immediate treatment and any delay (or the administration of too small a dose) may be fatal to the patient. It is, therefore, necessary to test various dosages of new drugs on animals before a drug can be sent to a hospital. If you can suggest another workable method of doing this we shall be happy to abandon our testing program on animals and adopt your suggestion.

As a matter of fact, the problem is even more complex than I have indicated. It often happens that even if a drug seems to be effective in curing a disease and does not seem to produce any undesirable immediate toxic effects, it may produce toxic effects after repeated administration. Take, for example, such an innocuous substance as sucrose (ordinary cane sugar). Solutions of sucrose were used not so long ago for the purpose of reducing excessive pressure in the brain cavity which, among other things, produced severe headaches. Sucrose solutions were injected into the blood stream and were found to be effective in bringing the pressure down to normal. However, it was later discovered that the intravenous injection of sucrose solution produced serious damage to the kidneys. You will therefore agree with me that it is much more sensible, and certainly more hu-

mane, to test drugs on animals before giving such drugs to humans.

I can certainly sympathize with you when you express concern about the possible cruelties involved in animal experimentation. This alleged cruelty is not in accordance with the facts. Our animals are well taken care of and are treated with the greatest concern and even love. Actually a mutual attachment often develops between the experimenters and the animals. Whenever painful procedures are absolutely unavoidable, general or local anesthesia is applied in the same manner as is commonly used in the hospitals on patients. Actually there is no more cruelty involved in our animal work than is encountered in the the best hospital operating rooms.

Apart from the benefit to mankind, animal experimentation also made it possible to protect animals against many diseases such as distemper, hog cholera, horse encephalitis and bovine tuberculosis. These protective measures could not have been developed without animal experimentation.

It is impossible for me to list all the benefits which accrued to mankind as a result of animal experimentation. To do this would require at least the pages of a full length book since the progress of medicine is practically synonymous with the progress of animal experimentation. The magnitude of these benefits can be appreciated from a recent statement by Dr. A. C. Ivy and Alfred Zobel. These scientists estimated that, as a result of medical progress based chiefly on animal experimentation, babies born in 1943 can expect to live 16 years longer than those born in 1902. Is that an example of wasted money and effort? Or take a more recent example. In the first World War more than 9 per cent of our soldiers died. Only 3 per cent of our men died in the last war due to newer medical discoveries based on animal experimentation. In other words, the lives of about 48,000 Americans were saved by experiments on animals during only two decades.

I have great respect for your feeling of compassion for all living creatures and for your humanitarian ideals. I am convinced that your opposition to our work is based not on malice but on misunderstanding. I suspect that the existence of this misunderstanding is more our fault than yours. It is due chiefly to the failure of medical scientists to explain to the people of this country what they are trying to do.

If you are convinced that we are doing the right thing, won't you use your talents and your energy to help us eradicate disease, or at least alleviate the pain and suffering caused by disease? If I failed to convince you, if there are any questions in your mind, won't you tell me?

Very sincerely yours,

S. A. Corson,
Department of Physiology,
University of Minnesota,
Medical School

GADGETS

Many technicians use paper cups for weighing small amounts of chemicals. These cups, the type used by the housewife in baking cup-cakes, are very useful in weighing photo chemicals in the home dark-room, and similiar amounts of reagents in the school laboratory.

Donald S. Lacroix,
High School,
Amherst, Massachusetts

AUDUBON JUNIORS

Form an AUDUBON JUNIOR CLUB in your class at school and stimulate the children's interest in exploring their own neighborhood this spring. There are birds and many other fascinating creatures to discover and to watch. Audubon Junior Clubs are nature clubs sponsored by the National Audubon Society to develop interest in the conservation of wildlife and other natural resources. Every club member receives a membership *Button;* 6 four-page *Bird Leaflets* each describing the habits of a bird throughout the year; 6 *Color Plates* of birds; 6 *Outline Drawings* of birds to color. Every club receives *Audubon Junior Club News,* a Junior club paper issued four times each school year. Every club adviser (the teacher who forms the club) receives *Audubon Teachers' Guide,* a 96-page booklet, attractively illustrated and containing many suggestions for nature adventures to be experienced outdoors and in the classroom. Ten children of elementary, junior or senior high school age constitute a club. Each club has an adult adviser. Club dues are 15 cents per member. Dues are paid to the adult adviser who forwards the combined club dues to AUDUBON JUNIORS, 1000 Fifth Avenue, New York 28, N. Y., with a letter stating how many sets of leaflets in the Junior or Senior edition are required.

Books

ADAMSTONE, F. B., and SHUMWAY, WALDO. *A Laboratory Manual of Vertebrate Embryology.* Second Edition. John Wiley and Sons, Inc., New York, and Chapman and Hall, Ltd., London. VII plus 96 pages. 38 drawings. 1947. $2.00.

This is a manual adapted to the planning of a course of four or six clock hours covering the embryology of frog, pig and chick. It is well illustrated, yet leaves space and suggestions for the student to add to its completeness with their own drawings and diagrams. The material is divided into three parts, treating the frog in 32 pages up to the 11-mm. embryo, the chick in 39 pages up to the 72-hour embryo, and the pig in 23 pages covering the anatomy of the 10-mm. stage, both internal and external anatomy.

The directions are written to meet the needs of beginners in the work. The value of learning through laboratory work is emphasized, and it is suggested that the success or failure of the student be determined largely by frequent quizzes. The directions in the manual are clearly expressed and are explicit in content. The drawings and diagrams are well labeled.

GUY F. WILLIAMS,
Colby Junior College
New London, N. H.

WILDE, S. A. *Forest Soils And Forest Growth.* Waltham, Mass., the Chronica Botanica Co.; New York City, G. E. Stechert and Co. xx + 241 pp. Illus. 1946. $5.00.

This volume is number 18 of a series entitled, *A New Series Of Plant Science Books,* edited by Dr. Frans Verdoorn, Editor of Chronica Botanica. Advanced students in soils, forestry, botany, game management, and landscape architecture will find this book meets the need for a concise and authoritative textbook dealing with many of the basic biological, physical, and chemical interrelations and interdependencies which abound in forests. Dr. Wilde, in his introductory chapter, begins the study with a historical and soil origin discussion. Various factors of the genesis of forest soils follow. Next, the essential biological features of forest cover, physical and chemical properties of forest soils are presented. A discussion of organisms, humus, soil forest types and surveys is also included. The book presents in readily accessible form recent practices, based on research, dealing with tree planting, amelioration, silviculture cutting, productivity of forest soils and management. Finally, the basic factors of establishing forest nurseries, the use of commercial fertilizers, lime, composts, and green manura crops in forest nurseries are considered with respect to commercial practices. The concluding work consists of fourteen pages of bibliography, international in scope. This should prove to be especially valuable to students doing research in forestry. The

indices include both an author's and a subject index. There are seven plates of photographs. The text illustrations number thirty-eight and, in addition, twenty tables. There is no glossary.

Readers of this book will agree that it reflects the highest standards of science writing credible to both author and publisher.

LEE R. YOTHERS,
Rahway High School,
Rahway, New Jersey

GOLDSTEIN, PHILIP. *Genetics Is Easy.* Garlan Publications, New Jersey. 72 pp. 1947. $0.75.

This soft covered five-by-eight little volume will be a welcome addition to the teaching aids of the biology teachers of the country. It includes many tidbits of useful material in the form of diagrams, charts, background material and motivating historical asides in the field of genetics. In addition to the basic genetic topics it also includes discussions of Lethals, Linkage, Cross Over, Multiple Genetic action, and Biochemical Genetics. It is simply written and will readily be understood by the interested or brighter biology student.

ALAN NATHANS

BOTANICAL SOCIETY

High school and college teachers of general botany and general biology courses are invited and encouraged to aid the cause of better teaching of general botany by sharing with their fellows any particularly effective demonstration methods or techniques they use. A committee of *The Botanical Society of America* is gathering new and outstanding ideas for such teaching aids for a general botany course and hereby solicits aid. Credit will be given to the sources of all ideas embodied in the report to be presented in September. The committee would particularly appreciate copies of local laboratory manuals and outlines of experiments not commonly used in currently published manuals. Please mail your suggestions to Dr. Hiram Thut, Eastern Illinois State College, Charleston, Illinois.

THE NEW MANAGING EDITOR

The job of managing editor has been taken over by Irving C. Keene of Brookline High School, Brookline, Massachusetts. Mr. Keene is well known to many of the members of the association as an energetic teacher and a leader in secondary education. His exhibits are well known to convention attenders who have been in his part of the state and nation. Readers of the journal know him as the author of many helpful articles; one of these, *Biology Nights,* appears next month. This is your official welcome, Irving, to one of the biggest jobs in the entire organization.

THANK YOU

Just a note of thanks to the retiring Managing Editor, O. D. Roberts, who took over the duties of the office after the resignation of Brad Price in 1945. "O. D." carried on the difficult job of the business end of the journal with the best of efficiency and cooperation. He built up a constructive advertising policy and an expanding list of satisfied advertisers. The journal owes a good deal of its success in the past few years to the concentrated and untiring effort of a busy man who has not only the peculiar abilities needed for a managing editorship but also an intense interest in both NABT and ABT. This little note is the official expression of thanks for a job well done.

Since the editor will be out of Emporia during most of the month of August, news items and other items intended for the October issue should be sent in before the end of July if possible, otherwise immediately after the first of September. The dummy for the October issue will be sent to the printer shortly after the first of September.

ENTRANCE REQUIREMENTS for medical schools approved by the *American Medical Association* have been compiled into a chart which lists for each school the minimum number of semester hours for each required subject, together with the total semester hours required for entrance. The data may be use-

ful in helping students choose the required subjects. The charts may be obtained from Craig Scott Rice, Sigma Chi House, 5615 Woodlawn Ave., Chicago 37, Illinois.

"GENETICS IS EASY" is the title of a booklet reviewed in this issue and recently advertised by Garlan Publications. It is of special interest to readers of *The American Biology Teacher* because the author is PHILIP GOLDSTEIN, who has been a contributor to the journal and has served it in various capacities.

SUMMER NUMBERS of *The American Biology Teacher* have often been considered, but have only this year become a reality, and this time only as a result of a series of accidental circumstances. The last two spring issues were extraordinarily delayed because of a combination of circumstances, including illness of a key member of the staff, the removal of the office of the managing editor to a point half way across the continent from the editor, the loss en route of a batch of manuscript, the loss of certain important materials in the process of moving the editor's office from one building to another and a long but unavoidable delay in the printer's plant. In terms of actual time, these two issues should be designated July and August respectively, but to avoid confusion in files and in libraries, we are giving them the usual dates of April and May. The staff is now working on a revised publication schedule which will assure that beginning with the first fall number, each issue will again appear, as according to the original plan, near the 15th of the month of issue. We hope this explanation will answer the several inquiries which both the editor and the managing editor have received from readers and that it will save the secretary some correspondence. We also wish to thank the readers for bearing with us through the delay.

BIOLOGICAL PHOTOGRAPHY

The convention of the *Biological Photographic Association* is to be held in Philadelphia September 8 to 10 at Houston Hall, University of Pennsylvania. There will be an interesting exhibition of prints, color transparencies and motion pictures in the field of biological photography. As an innovation, organized symposia and demonstrations are planned. Dr. Edmund J. Farris is president of the convention and Dr. Harry E. Morton is chairman. Further information about the meeting and the BPA can be obtained by writing the Secretary of the Biological Photographic Association, University Office, Magee Hospital, Pittsburgh 13, Pennsylvania.

Science and Security*

E. U. CONDON

Director, National Bureau of Standards

EDITOR'S NOTE: the copy of this address arrived too late for inclusion in a spring number, but due to the delay in printing it is possible to include it. The point at issue here is very important; therefore we are departing from our usual custom and dividing the contribution and printing part of it now and part of it later. We regret that it is not possible to print the address in full and at one time, but to do so would have delayed its printing for several more months.

The conflict of interest which arises from official secrecy regarding military applications of science and that freedom of inquiry which is necessary for the continued growth of science represents one of the most important problems of science today. By virtue of the intimate relationship between science and technology, the problem also and inevitably becomes one of great importance to the national welfare.

The scientific method is a very powerful thing. It is now in human history. Its power has only gradually won recognition during the past three or four centuries of human existence. Its fairly wide-spread development is a phenomenon of the last hundred years. Even today the use of the sci-

* Quotations from an address before the Washington Academy of Sciences, May 20, 1948, Washington, D. C.

entific method is not really widespread. Vast numbers of human beings, not only in so-called backward countries but also in so-called civilized countries, have only a most imperfect understanding of what it has done and can do.

The progress we have made in the physical and biological sciences has created and revolutionized engineering technology, agriculture and medicine. The resulting changes in the material circumstances of life have brought about enormous changes in our material way of life—as regards food, clothing, shelter, health, urban development, transportation and communication and even the social institutions by which productive effort is carried on.

Science is also largely responsible for the techniques by which war has become vastly more destructive and all encompassing than ever before. Today, as we have seen, major warfare requires the complete mobilization of every human and material resource of the nations that engage in it. And it results essentially in complete wreckage of the countries in which the war is fought.

We Americans simply do not realize what modern war would mean to us and I am afraid that, despite all warnings to the contrary from every quarter, many of us simply do not believe the next war will mean destruction of our cities.

Now this situation does confront us with a difficult problem for this reason: the increasing destructiveness of wars is a terrifying thing, and the prospect of an atomic war is even more terrifying. When people are really frightened they are less likely to act rationally than when they are serene. Shall we then refrain from talking about these facts or facing the truth? I believe there is no way to deal with this greatest threat of modern war to our security than to face the facts, as calmly and courageously as we can, but nevertheless to face them squarely and honestly, and try to work our solutions to our problems in a rational way.

We are committed to a policy in which we depend on military strength to reduce the likelihood of war. This requires that a large part of our scientific effort be devoted to ends which directly or indirectly increase the military potential of this nation. In this connection arise the difficult problems of conflict between scientific research and restriction of information about research which we wish to discuss here tonight.

The Concept of Security

The motivation behind the restriction of scientific information is simple, but the whole problem has become unnecessarily complicated and confused.

The dictionary meaning of the word security is "freedom from fear, anxiety, or care; confidence of power or safety." This is what the average man thinks of, and this is really the basic thought behind any program linked to the word.

However, there are at least two other uses of the word which are responsible for the confusion I have mentioned. The first of these is the expression "military security." Here what is meant is, clearly, the attainment of national security through military strength. This in modern society depends to a large extent, on developments in science and their applications in technology. Thus, advances in science and technology are largely responsible for any security that might be achieved through military strength.

The second sense in which the term "security" is now being used has to do with the classification of information, referring to the establishment of categories of secrecy and the establishment of such measures and procedures that certain types of information do not come into the hands of unauthorized persons.

Now this matter of keeping scientific information classified is a complicated one, and I am afraid that the public does not understand the basic problem involved in it. I can not stress too strongly that, if we are to attain those limited objectives of security through military security, we must progress in the sciences, because military strength rests on science and because the "secrets" of science are open to any investigators anywhere if they will put forth the requisite effort.

(*To be continued*)